

have been generous enough to assist the work by a donation of £70. This has been of considerable assistance in the purchase of paper, material, &c.

A manuscript of this nature is necessarily imperfect for any one genus until the whole literature has been gone through. As far as possible it is compiled from 1758 upwards, but often a side issue takes the compiler on even into the present year. Every book when completed is ticked off in some well-known Catalogue, and a catalogue slip is made, so as to allow of an alphabetical register.

It is believed that the plan adopted for preparing an 'Index Generum et Specierum Animalium' is so arranged and so carried out that the work is completed day by day so far as it goes, and that it would be easy for any individual to continue the carrying out of the scheme to-morrow should there be occasion to do so.

2. Remarks on the Dentition of Snakes and on the Evolution of the Poison-fangs. By G. A. BOULENGER, F.R.S.

[Received May 26, 1896.]

By the researches of Mr. G. S. West on the buccal glands of Snakes, the results of which appeared in the last volume of these 'Proceedings' (1895, p. 812), a further blow has been dealt to the taxonomic division of Snakes into poisonous and non-poisonous, a division I may claim to have been the first to abandon¹.

Certain statements in the above-mentioned paper, concerning the dentition, call for criticism. In the Introduction to the first volume of the 'Catalogue of Snakes,' it was pointed out that the indication of the number of teeth should refer to the full set in each maxillary, as "few specimens show the complete dentition, gaps occurring here and there, but shallow sockets in the bone indicate the bases of the missing teeth." This has not been taken into consideration by Mr. West, who erroneously ascribes diastemata between the solid teeth to *Leptodira*, these being simply due to loss of teeth in the specimen examined by him; the maxillary teeth form an uninterrupted series in that genus. Besides, it will be seen, by comparing his statements and figures with the indications in the 'Catalogue of Snakes,' that, in most cases, the number of teeth given by him is lower than the actual full set. The error I point out is an important one, since, were the teeth counted in that manner, hardly any two specimens of the same species would show the same number. It even often happens that every alternate tooth having dropped out, the jaw appears, on a superficial exami-

¹ My views have been accepted by Prof. Cope, who, in his latest classification (Tr. Amer. Philoa. Soc. xviii. 1895, p. 186), observes: "One result is that I am able to confirm the conclusion of Boulenger, *i. e.* that the Colubriform venomous Snakes, the Proteroglypha, do not differ in any fundamental respect from the non-venomous Colubridæ." Dr. Günther (Biol. C.-Am., Rept. 1895), on the other hand, still adheres to the old arrangement, as evinced by his continuing to intercalate the Boidæ, the most generalized of all Ophidians, between the Opiisthoglypha and the Proteroglypha.

nation, to possess only half the real number. As early as 1856, the late Dr. J. G. Fischer (Verh. Naturw. Hamb. iii. p. 23) warned observers against such a fallacy. With a little experience, it is easy enough to ascertain whether teeth are accidentally missing or whether true diastemata are present.

The author further mentions that the grooved teeth in the Opisthoglyphs vary in number from one to three. It should have been added that examples of as many as five grooved teeth occur in the genus *Oxybelis*.

With regard to the Proteroglyphs, it is a matter for regret that Mr. West should not have had an opportunity of examining specimens with all the maxillary and some of the mandibular teeth grooved, such as we find in the genus *Distira*. The presence of grooves on the posterior "solid" teeth was first pointed out by Thomas Smith (Phil. Trans. cviii. 1818, p. 472), and later by J. G. Fischer (*l. c.* p. 21). In 1890 (*P. Z. S.* p. 618) I recorded the presence of grooves on the mandibular teeth in a specimen of *Distira*, and I have since found them in another genus of Hydrophines, *Aipysurus* (*Cat.* iii. p. 303) and in an Elapine, *Glyphodon* (*t. c.* p. 313). It would have been highly interesting to ascertain whether any connection exists between the poison-gland and the small grooved maxillary teeth, and whether any correlative modification of the sublabial glands obtains in those forms in which the mandibular teeth show grooves.

I have previously expressed the opinion that the Viperine maxillary may be regarded as derived from the Opisthoglyph. In order to trace the probable evolution of the maxillary in Snakes, it suffices to survey the multitudinous modifications offered by the existing forms, for although possibly not one of them represents the actual groups through which evolution has taken place, they show clearly enough the various steps connecting the extreme types and the probable derivation of one type from the other.

In the first place, the hypothetical primitive Ophidian dentition is exhibited by *Xenopeltis* (*Cat.* i. p. 168), in which the maxillary, præmaxillary, and dentary are armed with very numerous, closely set, equal solid teeth. Next we have *Polyodontophis* (*t. c.* p. 181), which only differs in the absence of teeth on the præmaxillary bone. From this type numerous and gradual modifications arise through reduction in the number of teeth and irregularity in their size, leading to *Boodon* (*t. c.* p. 327) among the forms with persistent hypapophyses throughout the vertebral column, in which some of the anterior teeth, situated near the palatine process of the maxillary, become enlarged and fang-like, although still devoid of grooves. From such a type we may reasonably assume the Elapines, which still retain the hypapophyses, to have been derived through abbreviation and suppression of the portion of the maxillary anterior to the palatine process concurrently with the development of grooves in the anterior fangs. In the series now reached, the Elapinae (*Cat.* iii. p. 310), the groove becomes deeper and deeper, the margins of the tooth ultimately coalescing to form the

“perforated” fang of *Elaps* proper (*t. c.* p. 411), in which all other maxillary teeth have disappeared and the palatal and mandibular teeth are much reduced in number. In other genera of the same group the posterior maxillary teeth persist and may all acquire feeble grooves, as well as the anterior mandibular teeth (*Glyphodon*, p. 313). In the Proteroglyphs adapted to life in the sea, a similar series of modifications takes place. From the Aglyphodont forms, in which the teeth increase in size posteriorly, we are gradually led to the Opisthoglyphs, which are only to be distinguished by the presence of more or less deep grooves on the posterior fang-like teeth, the series culminating in such forms as have the maxillary bone much abbreviated, the solid teeth reduced to two or three, and the fangs extremely large and deeply grooved (*Miodon*, *t. c.* p. 250). If we then turn to the skull of the least specialized among the Viperidæ (*Causus*, *t. c.* p. 466) we see that the poison-fangs are situated on the posterior extremity of the maxillary, close to its articulation with the ectopterygoid, a condition which is identical with that of the Opisthoglyphous Colubrids. It is therefore clear to me that the Viperids have been derived from the Opisthoglyphs, and that there is no direct genetic relationship between them and the Proteroglyphs, contrary to the old view which represented the Elapines as forming the passage between the Colubrines and the Viperines. We have thus traced a nearly complete filiation, so far as the jaws and teeth are concerned, between the Colubridæ aglyphæ and the proteroglyphæ on the one hand, and between the former and the Viperidæ on the other.

Mr. West points to structural differences in the poison-glands between the Opisthoglyphæ and the Proteroglyphæ. It will be a matter for future investigation to ascertain whether he is justified in his assumption that the gland is homologous in these types or whether it has not been independently developed.

June 16, 1896.

Sir W. H. FLOWER, K.C.B.; LL.D., F.R.S., President,
in the Chair.

Mr. Sclater exhibited a drawing (Plate XXVIII.) of the Gnu of Nyasaland, taken by Mr. Caldwell from the specimen recently transmitted to him by Sir H. H. Johnston (see above p. 506), and now placed in the British Museum. Mr. Sclater pointed out the differences between this form and the ordinary form of the Brindled Gnu (to which the specimens now living in the Society's Gardens belonged), which consisted mainly in the generally brownish colour of the fur and the broad whitish band across the face above the eyes, and proposed for it the subspecific name *Connochetes taurinus johnstoni*. From the British-East-African form